METEOROLOGY

THE METEOROLOGY MAJOR AT A GLANCE: Meteorology is the study of atmospheric phenomena. The meteorology major provides the background necessary for understanding atmospheric behavior over a broad range of time and space scales. These include small features such as turbulent eddies and tornadoes; medium-sized features such as squall lines, hurricanes and blizzards; and even larger features such as continental weather and climate regimes and waves in the jet stream.

The science of meteorology has experienced dramatic changes. New observation techniques based on remote sensing have improved our understanding of weather phenomena and their interrelationships. Images of the earth taken from satellites have given us a truly global weather perspective. Doppler radars enable us to look at the circulations within thunderstorms to try to identify whether they might generate a tornado. Coupled with this increased observational capability, the introduction of sophisticated numerical weather prediction models has greatly improved our ability to forecast the weather.

The meteorology major requires a strong foundation in physics, geography and mathematics, in addition to an aptitude for problem solving. Many of the decisions Air Force officers make, from planning deployments and air strikes in a time of war to launching the Space Shuttle, flying a sortie, or simply deciding what uniform to wear on a particular day, are affected by weather. While graduates in the meteorology major are academically qualified to enter the weather career field, future pilots and navigators can greatly benefit from a better understanding of the environment in which they fly.

COURSE REQUIREMENTS: 148 Semester Hours

A. *85 Semester hours of Dean's academic core courses to include the following core alternatives:*

Core Substitute		**Substitutes for**
Geog 310	Geospatial Data Systems	Systems Option

B. *6 Semester hours of Commandant's academic core courses.*

C. *5 Semester hours of Director of Athletics' core courses.*

D. 3 *Semester hours of Academy Options.*

E. *6 Semester hours of Foreign Language Core Options.*

F. *43 Semester hours of major's courses*:

1. Math 243 Calculus III

2. Meteor 320 Introduction to Atmospheric Science
3. Meteor 325 Weather Data, Analysis and Quantitative Methods
4. Meteor 330 Atmospheric Physics
5. Meteor 352 Climatology
6. Meteor 430 Atmospheric Dynamics I
7. Meteor 431 Atmospheric Dynamics II
8. Meteor 440 Synoptic-Dynamic Meteorology Laboratory
9. Meteor 451 Synoptic Meteorology
10. Meteor 452 Mesoscale Meteorology
11. Meteor 465 Marine and Tropical Meteorology
12. Physics 370 Upper Atmospheric and Geo-Space Physics
13. One Meteorology Elective course from the following:
    - Geog 351 Physical Geography
    - Math 245 Differential Equations and Matrices
    - Meteor 499 Independent Study
    - Physics 315 Combat Aviation Physics
14. Academic Division Option
15. Meteor 405 First-Class Seminar

SUGGESTED COURSE SEQUENCE:

Meteorology Major

	4º	hrs	per	3º	hrs	per	2º	hrs	per	1º	hrs	per
	Chem 141	3	2	Math 243	3	1	Meteor 320	3	1	Meteor 430	3	1
	Comp Sci 110	3	1	**Beh Sci 110**	3	1	Meteor 325	3	1	Meteor 440	3	1
Fall	**English 111**	3	1	**English 211**	3	1	**Pol Sci 311**	3	1	Meteor 451	3	1
	Math 141	3	1	**Physics 215**	3	2	**El Engr 215**	3	1	***Academy Option***	3	2
	Engr 100	3	1	**Engr Mech 120**	3	1	**Math 300**	3	1	**English 411**	3	1
				Foreign Lang I	3	2	**Law 220**	3	1	**Astro Engr 410**	3	1
	Phy Ed	0.5	2	*Phy Ed*	1	2	*Phy Ed*	1	2	*Phy Ed*	1	2
		15.5	8		19	10		19	9		19	9
	Soc Sci 112	3	1	Meteor 352	3	1	Meteor 330	3	1	Meteor 405	0	1
	Chem 142	3	2	**Civ Engr 210**	3	1	Physics 370	3	1	Meteor 431	3	1
Spring	**Math 142**	3	1	**Econ 200**	2	1	**Beh Sci 310**	3	1	Meteor 452	4	2
	History 101	3	1	**Mgt 200**	2	1	**Aero Engr 315**	3	1	Meteor 465	3	1
	Physics 110	3	2	**Biology 215**	3	2	**Philos 310**	3	1	Meteor Elective	3	1
	MSS 100	3	1	**History 202**	3	1	**Geog 310**	3	1	Open Option	3	1
	Phy Ed	0.5	2	**Foreign Lang II**	3	2	*Phy Ed*	0.5	2	**MSS 400**	3	1
				Phy Ed	0.5	2						
		18.5	10		19.5	11		18.5	8		19	8

Course Unit Summary
Core (31)
Major (14)
Academy Option (1)
Foreign Language (2)
Phy Ed (10)

Semester Hour Summary		
Core =	**91.0**	Sem Hours
Major =	43.0	"
Academy Option=	3.0	"
Foreign Languages=	6.0	"
Phy Ed =	5.0	"
Total =	**148.0**	"

METEOROLOGY (Meteor)

Offered by the Department of Economics and Geography (DFEG) and the Department of Physics (DFP)

Meteor 320. Introduction to Atmospheric Science. 3(1). A survey course in the fundamentals of meteorology. Emphasis will be placed on flight weather and its impact on aviation. Topics include atmospheric thermodynamics, cloud physics, air masses and weather systems, weather forecasting, severe weather, hazards to aviation, introduction to weather satellites and radar, and an introduction to the near-earth space environment. Administered by the Department of Physics. Final exam. Prereq: Physics 215. Sem hrs: 3 fall.

Meteor 325. Weather Data, Analysis and Quantitative Methods. 3(1). An introduction to the data sources, objective and subjective data analysis techniques, and quantitative methods used in meteorology. Topics include conventional surface and upper air data, fundamentals of radar and satellite observations, weather map analysis, and quantitative methods covering partial derivatives, vector analysis, kinematic properties of fluid flow, Lagrangian and Eulerian frames of reference, and numerical integration and differentiation. Practical application of the above quantitative techniques to weather charts and vertical atmospheric soundings are emphasized. Administered by the Department of Economics and Geography. Final exam. Prereq: Math 243. Coreq: Meteor 320. Sem hrs: 3 fall.

Meteor 330. Atmospheric Physics. 3(1). Classical radiative transfer, thermodynamics and microphysics applied to the atmosphere. Topics include atmospheric absorption and attenuation, the gas laws, the first and second laws of thermodynamics, water-air systems, isobaric, adiabatic and isentropic processes, thermodynamic diagrams, atmospheric statics and vertical stability, atmospheric aerosols, nucleation of water vapor and ice, cloud droplet and ice crystal growth and precipitation generation. Administered by the Department of Physics. Final exam. Prereq: Math 243 and Meteor 320. Sem hrs: 3 spring.

Meteor 352. Climatology. 3(1). An introduction to climatology, including fundamental, long-term processes involving energy, moisture and momentum transfer in the earth's climate system. Topics include understanding current world climate patterns and climate change, and applying climatology to enhance human activities. Administered by the Department of Economics and Geography. Final exam. Prereq or Coreq: Soc Sci 112. Sem hrs: 3 spring.

Meteor 405. First-Class Seminar. 0(1). An applications-based course providing cadets with an operational overview of the weather AFSC, and its support of Air Force and Army operations worldwide. Topics include the history of AF weather, the development of weather effects matrices, and operational weather support to AF, Army and space operations, including a mock overseas deployment of an operational aviation squadron. Open only to Meteorology majors. Administered jointly by the Department of Physics and the Department of Economics and Geography. Pass/Fail. No final exam. Prereq:

C1C Standing. Sem hrs: 0 spring.

Meteor 430. Atmospheric Dynamics I. 3(1). An advanced course in atmospheric dynamics. Topics include continuity, thermodynamic energy, the equations of motion, hydrostatic balance, generalized vertical coordinate systems, balanced and unbalanced flows, circulation, vorticity and potential vorticity, and quasi-geostrophic theory. Administered by the Department of Physics. Final exam. Prereq: Meteor 325 and Meteor 330. Sem hrs: 3 fall.

Meteor 431. Atmospheric Dynamics II. 3(1). Advanced applications of atmospheric dynamics. Topics include advanced quasi-geostrophic applications, baroclinic instability, cyclogenesis, fronts and frontogenesis, atmospheric wave theory and behavior, boundary layer physics, and numerical weather prediction. Administered by the Department of Physics. Final exam. Prereq: Meteor 430. Sem hrs: 3 spring.

Meteor 440. Synoptic-Dynamic Meteorology Laboratory. 3(1). A laboratory course emphasizing the use of meteorological observations, analyses and forecasts to describe the structure and dynamics of large-scale atmospheric systems. Involves extensive use of conventional surface and upper-air observations, satellite and Doppler radar data, and numerical forecast products in the meteorology laboratory. Administered jointly by the Department of Economics and Geography and the Department of Physics. Final exam. Prereq: Meteor 325 and Meteor 330. Coreq: Meteor 430 and Meteor 451. Sem hrs: 3 fall.

Meteor 451. Synoptic Meteorology. 3(1). Study of the development and evolution of large-scale weather systems, including surface and upper level pressure, temperature and wind patterns, air masses, fronts, extratropical cyclones and jet streams. Administered by the Department of Economics and Geography. Final exam. Prereq: Meteor 325 and Meteor 330. Coreq: Meteor 430 and Meteor 440. Sem hrs: 3 fall.

Meteor 452. Mesoscale Meteorology. 4(2). Study of the structure, development and evolution of mesoscale weather systems. Topics include fronts and jet streaks, instabilities, gravity waves, convective storms, squall lines, tornadoes, and mesoscale convective complexes. Introduction to analysis techniques and nowcasting. Extensive use of real-time satellite and Doppler radar data and numerical forecast products in meteorological laboratory. Administered by the Department of Economics and Geography. Final exam. Prereq: Meteor 440 and Meteor 451. Sem hrs: 4 spring.

Meteor 465. Marine and Tropical Meteorology. 3(1). Introduction to the marine environment including the structure of the ocean environment, visibility at sea, and sea-state and swell forecasting, and to the tropical environment including understanding the interactions between the tropics and mid-latitudes, tropical cyclone structure and tropical cyclone forecasting. Particular emphasis will be placed on how these environments affect joint Naval and Air Force operations. Instruction includes Video-Teleconferencing, and computer and web-based learning. Administered by the Department of Economics and Geography. Final Exam or Final Project. Prereq: Meteor 451. Coreq: Meteor 452. Sem

hrs: 3 spring**.**.

Meteor 470. Aviation Meteorology. 3(1). A survey course in aviation weather. Integrates fundamental meteorological principles with application to aviation. Topics include atmospheric composition, properties and structure, basic radiative transfer, fundamental atmospheric forces, vertical motion and stability, atmospheric circulation systems, aviation weather hazards and aviation weather resources. Not open to Meteorology majors. Administered by the Department of Physics. Final exam. Prereq: Phys 215. Sem hrs: 3 fall.

Meteor 499. Independent Study. 3(0). Individual research under the direction of a faculty member. Research paper or final project. Prereq: Department permission. Sem hrs: 3 fall or spring.

Meteor 499A. Independent Study. 1.5(0). Individual research under the direction of a faculty member. Research paper or final project. Prereq: Department permission. Sem hrs: 1.5 fall or spring.